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(54) Title: ANHYDROUS CHEWING GUM (57) Abstract A flexible and substantially anhydrous chewing gum composition comprises chewable gum base, flavor, a substantially anhydrous plasticizing agent selected from the group consisting of glycerol and propylene glycol and constituting more than 10% by weight of the composition, and a substantially anhydrous bulking agent. The total moisture content of the gum composition does not exceed 1% by weight. The gum composition has the characteristics of improved flexibility, texture and shelf life and provides maximum stability for any moisture-sensitive ingredients in the gum.		

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ANHYDROUS CHEWING GUM

This invention relates in general to chewing gum compositions which are substantially anhydrous.

As is well-known in the art, chewing gum generally comprises chewable gum base, a flavor, a
5 sweet water-soluble bulking agent, a plasticizing agent, and, optionally, an artificial sweetener and a coloring agent. Typically, the bulking agent includes an aqueous carbohydrate syrup (such as corn syrup) in the case of sugar gum and an aqueous sugar alcohol
10 solution in the case of sugarless gum. Such aqueous solutions typically contain about 15% to 30% water with the result that the moisture level of conventional chewing gum is about 2% to 6% by weight.

Conventional sugar chewing gum is prepared
15 by adding a plasticizing agent, aqueous carbohydrate syrup and an optional coloring agent color to gum base in a running mixer. Sugar is then added, followed by flavor in a desired amount. Conventional sugarless chewing gum is prepared by adding a sugar alcohol to
20 gum base and an optional coloring agent in a running mixer. An aqueous sugar alcohol solution and a plasticizing agent are then incorporated into the gum mass. Lastly, a desired amount of flavor is added. In either case, the gum is then rolled or extruded and
25 cut into the desired shape. After cooling, the gum is wrapped in a well-known manner.



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It is generally thought that conventional moisture levels of 2% to 6% are required to maintain a flexible chewing gum texture. Typical chewing gum will lose moisture and become stiff and brittle upon storage in a relative humidity below that of the equilibrium relative humidity of the gum. For this reason, chewing gum is typically wrapped in a moisture-impermeable package to prevent loss of moisture content. Moisture may eventually migrate to the surface of the gum, causing the gum to adhere to its wrapper.

In order to prevent the deterioration of certain moisture-sensitive chewing gum ingredients, it has been found desirable to minimize the moisture content of the gum. For example, it is well known that the stability of artificial dipeptide sweeteners such as aspartame (L-aspartyl-L-phenylalanine methyl ester) in a food system is a function of water activity, time, temperature and pH. In aqueous systems, aspartame spontaneously converts to diketopiperazine with proportional loss of sweetness. The rate of this conversion reaction can be controlled by minimizing the water activity in food systems containing such ingredients.

Prior to the present invention, solutions to the problem of storage stability of aspartame in chewing gum have been discussed in U. S. Patent Nos. 4,122,195 and 4,139,639, which teach encapsulation of aspartame. However, this requires an additional process step. U. S. Patent No. 4,246,286 discloses another chewing gum product which has a water extract pH of between 5.0 and 7.0 and which is free of calcium carbonate and strongly basic constituents in order to prevent the degradation of aspartame. This approach requires the use of a non-basic filler such as talc, which is more costly and less desirable than calcium carbonate. Furthermore, the pH of the gum must be controlled to be within a certain range, thereby limiting the ingredients which can be



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used in the chewing gum. Despite these disadvantages of prior known solutions to this storage stability problem, the use of a substantially anhydrous gum to stabilize aspartame has not been disclosed in the
5 prior art.

Another example of a moisture-sensitive ingredient is red beet color, which is a dye extracted from beets. Because this dye contains no artificial ingredients, it is commonly used in a variety of food products
10 including chewing gum. This dye is reactive in the presence of moisture with the result that the red color fades with time.

Other moisture-sensitive ingredients which may be used in chewing gum include enzyme systems. Because
15 water causes oxidation and reduction reactions of such ingredients, it is important to minimize the moisture content of the chewing gum.

Acid anhydrides have been shown to enhance some flavors. However, because acid anhydrides are unstable
20 in moist environments, they are not used in conventional chewing gum.

Accordingly, the present invention provides a flexible and substantially anhydrous chewing gum composition comprising chewable gum base, flavor, a sub-
25 stantially anhydrous plasticizing agent selected from the group consisting of glycerol and propylene glycol and constituting more than 10.0% by weight of the composition, and a substantially anhydrous bulking agent, the total moisture content of the composition being less than 1.0%
30 by weight thereof.

The substantially anhydrous chewing gum composition has advantageous characteristics of improved flexibility, shelf life and gum texture. The gum composition provides maximum stability for any moisture-
35 sensitive ingredients which may be present in the gum.



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A substantially anhydrous bulking agent is used instead of aqueous carbohydrate syrup or an aqueous sugar alcohol solution used in conventional chewing gum. The addition of moisture during the chewing gum formulation process is avoided. Furthermore, a substantially anhydrous plasticizing agent is selected from the group consisting of glycerol and propylene glycol, the plasticizing agent constituting more than 10% by weight of the gum composition.

10 Conventional chewing gum usually contains 1% to 2%, but not more than 5%, glycerol by weight. Prior to the present invention, a glycerol content of more than 5% by weight of a chewing gum composition was generally thought to render the gum too liquid or produce
15 an unacceptably soft or non-cohesive texture. It has been found that the use of a glycerol or propylene glycol plasticizing agent constituting more than 10%, and preferably about 17%, by weight of the chewing gum composition provides excellent texture, shelf life and
20 flexibility characteristics when less than 1% by weight moisture is present in the gum.

By avoiding a moisture content greater than 1% by weight of the chewing gum composition, there is provided maximum stability for moisture-sensitive ingredients which may be present in the gum. The preferred
25 chewing gum does not lose moisture when stored in a dry environment, thereby avoiding the problems of hardness and brittleness encountered upon storage of conventional gum. Unlike typical gum, the preferred chewing gum
30 composition does not tend to stick to its wrapper, and does not require moisture-impervious wrapping, thereby permitting a reduction in packaging costs.

The preferred chewing gum composition comprises any chewable and substantially water-insoluble gum base
35 in an amount ranging from approximately 18% to 50%, but preferably 25%, by weight of the total chewing gum



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composition. The gum base may contain a calcium carbonate filler instead of a talc filler even where an artificial sweetener comprising a dipeptide such as aspartame (L-aspartyl-L-phenylalanine methyl ester, originally disclosed in U. S. Patent Nos. 3,492,131 and 3,642,491) is used in the chewing gum. The calcium carbonate base has better chewing characteristics and is less expensive than the talc base.

The chewing gum also includes a substantially anhydrous plasticizing agent consisting of either glycerol or propylene glycol. The plasticizing agent constitutes more than 10%, but preferably about 17%, by weight of the chewing gum composition. This plasticizing agent, containing less than 1% by weight moisture, provides flexibility and texture characteristics better than or equal to conventional sugar gums and much better than conventional sugarless gums. Preferably, the gum contains a high-quality glycerine comprising at least 99% glycerol with the remainder being moisture. Propylene glycol tends to impart a bitter taste to the gum.

The preferred composition also comprises a sweet and water-soluble bulking agent which is substantially anhydrous. For sugar gums, the bulking agent may consist of dextrose, sucrose, maltose, dextrin, dried invert sugar, fructose, levulose, galactose or corn syrup solids or combinations thereof. For sugarless gums, the bulking agent may comprise a sugar alcohol such as sorbitol, mannitol, xylitol or combinations thereof. The bulking agent is present in an amount ranging from 30% to 65% by weight of the entire chewing gum composition. Optionally, an artificial sweetener such as saccharin, cyclamate, thaumatin, acesulfame K or, preferably, a dipeptide sweetener such as aspartame, or a combination of such sweeteners, may be included.

Aqueous bulking agents such as carbohydrate solutions and sugar alcohol solutions are avoided. More-



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over, no water is added during the chewing gum manufacturing process. The total moisture content of the chewing gum composition of the present invention is less than 1% by weight of the composition and preferably less than 0.5%.

The chewing gum also comprises a well-known flavor such as an essential oil or synthetic flavor in an amount determined by preference, but generally about 1% of the chewing gum composition.

The chewing gum optionally comprises a coloring agent in a conventional amount of about 0.1% to about 2% by weight of the gum composition. If the coloring agent comprises a moisture-sensitive red beet dye, the low moisture content of the chewing gum will prevent fading of the red color over time.

The chewing gum can be manufactured in a conventional manner. First, the base is heated and placed in a mixer. If color is desired, it may be added at this point followed by the bulking agent, artificial sweeteners (if desired), the plasticizing agent, and flavor, in that order. The mixture is rolled or extruded, cut into individual pieces and cooled. The gum is then wrapped in a well-known manner. To further reduce its moisture level, the gum may be stored in a low-humidity environment prior to being wrapped.

As described earlier, the preferred chewing gum composition promotes maximum stability for moisture-sensitive ingredients which may be included in the chewing gum composition. It has been found the aspartame has desirable sweetness characteristics and is ideal for inclusion as a sweetener in chewing gum. Because of its low moisture content, the composition promotes storage stability of aspartame in chewing gum without requiring encapsulation of the aspartame, control of the pH of the gum or the use of non-basic gum ingredients.



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In addition to promoting stability of moisture-sensitive ingredients mixed into the gum mass, the composition promotes the stability of such ingredients when applied to the surface of the gum due to the fact
5 that the gum will not "sweat" during prolonged storage.

The low moisture content of the composition also permits the use of a food grade acidulant to provide tartness, even where the gum contains a calcium carbonate filler; the low moisture content will minimize reaction
10 between the acidulant and the basic filler. Food grade acid anhydrides, which are moisture sensitive, may also be used to provide tartness or enhance the gum flavor. The acidulant or acid anhydride typically constitutes about 0.1 to 1% by weight of the gum composition.

15

EXAMPLE I

A sugarless chewing gum containing aspartame was manufactured according to the following formulation:

	<u>Ingredient</u>	<u>Percent by Weight</u>
	Gum base	24.5
20	Glycerine	16.8
	Sorbitol powder	49.0
	Mannitol powder	8.0
	Flavor	1.3
	Color	0.25
25	Aspartame	0.1

The glycerine plasticizing agent comprises at least 99% glycerol with the remainder being moisture.

EXAMPLE II

Sugarless chewing gum was manufactured according
30 to the following formulation in which the coloring agent is a moisture-sensitive ingredient comprising a red beet color:



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	<u>Ingredient</u>	<u>Percent by Weight</u>
	Gum base	24.5
	Glycerine	16.8
	Sorbitol powder	47.7
5	Mannitol powder	8.0
	Flavor	1.3
	Red beet color	1.7

Again, the glycerine comprises at least 99% glycerol. The chewing gum was rolled into sheets and
10 a rolling compound consisting of 89% mannitol, 9% calcium carbonate and 2% aspartame was applied to the surface of the chewing gum. The gum was then wrapped in a conventional manner.

EXAMPLE III

15 A sugar gum was manufactured according to the following formulation:

	<u>Ingredient</u>	<u>Percent by Weight</u>
	Gum base	25.0
	Glycerine	12.0
20	Sugar	61.2
	Grape flavor	1.5
	Color	0.1
	Acetic anhydride	0.2



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CLAIMS

1. A flexible and substantially anhydrous chewing gum composition comprising chewable gum base and flavor, and characterized by a substantially anhydrous plasticizing agent selected from the group consisting of glycerol and propylene glycol and constituting more than 10.0% by weight of the composition, and a substantially anhydrous bulking agent, the total moisture content of the composition being less than 1.0% by weight thereof.
2. The composition of claim 1, characterized in that the plasticizing agent constitutes about 17.0% by weight of the composition.
3. The composition of claim 1, characterized in that the bulking agent is a sugar alcohol.
4. The composition of claim 1, characterized in that the composition comprises a moisture-sensitive ingredient.
5. The composition of claim 4, characterized in that the moisture-sensitive ingredient is mixed into the gum composition.
6. The composition of claim 4, characterized in that the moisture-sensitive ingredient is coated onto the surface of the gum composition.
7. The composition of claim 4, characterized in that the moisture-sensitive ingredient comprises a dipeptide sweetener.
8. The composition of claim 7, characterized in that the sweetener is L-aspartyl-L-phenylalanine methyl ester.
9. The composition of claim 4, characterized in that the moisture-sensitive ingredient comprises an enzyme.
10. The composition of claim 4, characterized in that the moisture-sensitive ingredient comprises a red beet coloring.



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11. The composition of claim 1, characterized in that the composition comprises a food grade acid anhydride.

12. The composition of claim 1, characterized
5 in that the composition comprises a food grade acidulant, and wherein the base comprises a calcium carbonate filler.



INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 83/01651

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ³ : A 23 G 3/30		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC ³	A 23 G	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category *	Citation of Document, ¹⁴ with Indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁴
X	US, A, 3857965 (R.L. REAM) 31 December 1974 see column 4, lines 17-20; column 3, lines 1-10, 30-42; example, column 3, lines 45-65	1-5
Y	--	3-5, 7, 8
P, Y	FR, A, 2506570 (S.R. CHERUKURI et al.) 3 December 1982 see claims 1, 6	1, 10
P, X	EP, A, 0082670 (Y.R. KUO-HOW et al.) 29 June 1983 see claim 1; examples 1, 2, 3; page 11, lines 12-21; page 8, lines 7-16; page 6, lines 1-5, 16-20	1-12
Y	US, A, 3336141 (J.L. FRISINA) 15 August 1967 see claims 1, 4, 5; column 5, lines 16-20 52-56	1, 10
Y	US, A, 4132793 (G.J. HABER et al.) 2 January 1979	./.
<p>* Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search *	Date of Mailing of this International Search Report *	
28th February 1984	21 MARS 1984	
International Searching Authority *	Signature of Authorized Officer ¹⁶	
EUROPEAN PATENT OFFICE	G.L.M. Knydenberg	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No ¹⁸
	see claim 5; column 7, lines 18-24; column 10, table ---	1,10
Y	US, A, 3262784 (R.C. BUCHER) 26 July 1966 see claims 1,2,8,10; column 6, line 20; column 4, lines 42-44; column 3, lines 72-74 ---	1,12
Y	FR, A, 2353230 (R.E. KLOSE et al.) 30 December 1977 see page 2, lines 35-40; page 8, table V; claim 1 ---	1,3-5,7,8
Y	US, A, 2635964 (E.J. HEWITT et al.) 21 April 1953 see claims 1,2; examples 4,5 ---	1
Y	GB, A, 2053651 (F. DEVOS et al.) 11 Februa- ry 1980 see page 1, lines 85-92; 94-98 ---	1
Y	US, A, 3352689 (A.G. BILOTTI) 14 November 1967 see column 3, lines 70-75 ---	9
Y	US, A, 3075884 (A.G. BILOTTI) 29 January 1963 see column 2, lines 61-64; claims 1,2 ---	9
A	US, A, 2586675 (W.J. LUTZ) 19 February 1952 ---	
A	US, A, 3422184 (M.I. GOLDMAN et al.) 14 January 1969 -----	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO.

PCT/US 83/01651 (SA 6063)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 12/03/84

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3857965	31/12/74	None	
FR-A- 2506570	03/12/82	BE-A- 893374 DE-A- 3220522 JP-A- 58000873 US-A- 4371549	01/12/82 30/12/82 06/01/83 01/02/83
EP-A- 0082670	29/06/83	AU-A- 9165582 JP-A- 58129935	30/06/83 03/08/83
US-A- 3336141		None	
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US-A- 2635964		None	
GB-A- 2053651	11/02/81	FR-A,B 2459002 DE-A- 3021775 NL-A- 8003369 JP-A- 56039748 US-A- 4382962 SE-A- 8004307	09/01/81 18/12/80 17/12/80 15/04/81 10/05/83 16/12/80
US-A- 3352689		None	
US-A- 3075884		None	

For more details about this annex :
see Official Journal of the European Patent Office, No. 12/82

INTERNATIONAL APPLICATION NO.

PCT/US 83/01651 (SA 6063)

US-A- 2586675		None			

US-A- 3422184	14/01/69	NL-A-	6614699	24/04/67	
		BE-A-	688263	16/03/67	
		CH-A-	491647	15/06/70	
		DE-A-	1617384	18/03/71	
		GB-A-	1142377		

 For more details about this annex :

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